Synopsis For Ph D Registration

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''Studies on synthesis, charecterization and application of NaX dopped zeolites ''

A Synopsis Submitted To The

S.R.T.M.UNIVERSITY, NANDED

For The Degree Of Doctor Of Philosophy

In

Chemistry

Under The Faculty Of

Science & Technology

By

Ms. Shital Prakash Jadhav

Under The Guidance Of

Dr. Vijaykumar S. More

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S.R.T.M.university, Nanded.

Title - Studies on Synthesis, Characterization and Applications of NaX dopped Zeolites

Introduction:-

In recent years, research interest has focussed on utilizing waste materials for the production of valuable products via an environmentally friendly process. Rice husk ash (RHA) is one such waste product in the agriculture sector. It is usually dumped as land-fill material causing environmental pollution in the neighbouring areas. Due to its high pozzolonic properties, RHA is used in the cement industry to enhance the durability of concrete. The silica content of RHA is more than 90 wt%. By extracting SiO2 from RHA, silica and silica-based products such as SiC, Si3 N4, SiCl4 and zeolite can be produced [1].

Rice husk ash (RHA), the agro-waste material, is used as a silica source for the preparation of NaX zeolites [2]. Using waste materials such as RHA is important from an environmental, economic and industrial point of view. Extraction of silica from RHA is a tedious process, however, in light of which involves many processing steps towards the preparation of NaX zeolite. Zeolites are microporous crystalline aluminosilicates containing easily large amounts of extra framework cations. Thus, they have valuable exchange properties and are applied in water and wastewater treatment [3].

Study background (Literature survey) and significance of study:

In the Indian subcontinent rice production has been taken in large areas. While processing raw material, the husk of rice is burned down. As this is a major environmental issue from the rice

field. Knowing the large percentage of SiO_2 is present in rice husk and useful for synthesis and alternative source of synthetic zeolite, as rice husk contains a major amount of organic material almost 70–80 %. It has been removed by burning under suitable temperature. The remaining ash was alkaline and oxidized to get a pure source of SiO_2. As such this silica is used to make different zeolite and natural as well as synthetic zeolite found similar chemical and physical properties.

NaX zeolite having various applications including paraffin cracking, metal ion extraction, gas storage, NH_3 and CO_2 adsorption study, as a catalyst, ion exchange specifically with transition metals which depends upon structural properties of NaX zeolite. Sodium X zeolite has been synthesized from various methods, it includes microwave assisted-hydrothermal synthesis [4], gelation method [5], reinventing rice husk ash derived NaX zeolite [6], Literature search revels that NaX zeolite has ion exchanged properties and includes Transition metals and find useful as heterogeneous catalysis [5,6], Study on modification of NaX Zeolites with Transition metals nd applied as photo catalyst activated by visible radiation used in waste water treatment [7]. The most common use of NaX zeolite is used as adsorbent. Looking at the structural features and common ion exchange process with transition metals, we are planning to use some of the transition metals and prepared zeolites of NaX- by ion exchange method in solution based adsorption. The synthesized combined zeolites were characterized by the various methods as powder XRD method, TGA DTA, UV-spectroscopy, SEM-EDX methods.

Objectives of study:

- To develop novel method for synthesis of NaX Zeolites.
- Synthesis of different NaX Zeolites with Transition metals and similar compounds.
- Characterization of synthesized material using different sophisticated techniques such as IR spectroscopy, UV spectroscopy, XRD, TGA-DTA, SEM etc.

Research methodology

- The proposed synthesis of NaX dopped Zeolites will done at research center that may include transition metals.
- The synthesized materials will be sent for characterization to National level institutes.

- The characterization techniques such as such as IR spectroscopy, UV spectroscopy, XRD, TGA-DTA, SEM etc. will be used to assign the utilization of synthesized compound.
- The characterization data will be interpreted.
- The characterized compounds will be sent to collaborators for further study.
- The results will be published in international repute journal.

Importance of Study:-

National status

Following research groups are working on NaX Zeolite for these applications in India-

- Dr. Mahendra N. Lokhande, Department of Chemistry, Avvaiyar Government College for Women, Karaikal 69602, India.
- Dr. Subramanian E., Department of Chemistry, Manonmaniam Sundaranar University, Tirunelveli-627012, India.
- Dr. Musti S. Rao, Department of Chemical Engineering, Indian Istitute of Technology, Kanpur, 208016, India.
- Dr. Milan Kanti Naskar, Ceramic Research Institute (CSIR), Kolkata, India.
- Dr. Sangamitra Barman, Department of Chemical Engineering, Indian Institute of Technology, Kharagpur, 721302, India.

International status

Following research groups are working on NaX Zeolite for these applications at international level –

- J. G.G. Mendoza, Chemical Technology, Department of Civil, Environmental and Natural Resources Engineering, Luleå University of Technology, SE - 971 87, Sweden.
- J.L. Zhou, School of Civil and Environmental, University of Technology, Sydney, Australia.
- Mohammad Boshir Ahmed, School of Materials Science and Engineering, Gwangju Institute of Science and Technology, Gwangju 61005, Republic of Korea
- Dr. Junko Ishida, Hoshi University, 2-4-41 Ebara, Shinagawa, Tokyo 158-0098, Japan
- Dr. Ching-Yuan Su, AndroScience Corporation, 11175 Flintkote Avenue, Suite F, San Diego, California, USA.
- Prof. Zhi-Su Huang, School of Pharmaceutical Sciences, Sun Yat-Sen University, Guangzhou 510006, People's Republic of China.
- Bentuo Xu, School of Life and Environmental Science, Wenzhou University, Wenzhou 325035, China
- Abdul Khaleque, Department of Applied Chemistry and Chemical Engineering, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj 8100, Bangladesh
- Aveen H. Matti, Department of Chemistry, college of Science, University of Salahaddin, Erbil, Kurdistan.

Significance of the study:-

- Applications of synthesized NaX Zeolites is Ion exchange with transition metals, as a catalyst, gas storage, NH_3 and CO_2 adsorption study etc.

Statistical plan

- 0 to 6 months literature survey.
- 7-17 months procurement of chemicals, glassware and minor instruments required for research.

- 17 to 24 months synthesis of NaX Zeolite and reaction with different transition metals.
- 12 to 30 months characterization of synthesized material.
- 25 to 36 months compilation of data
- 25 to 36 months thesis writing and research articles writing
- 24 to 36 months presentation of research work in National/International conferences.

Limitations of study

- The library resources such as subscription of reputed journals, etc. are not available. That may impact the research work.
- The characterization of synthesized compounds has to be done at national level institutes and that may delay the research.

Select bibliography

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